

REMARKS

A reply was filed on March 3, 2003 in response to a final office action dated December 2, 2002. In response to the reply, an advisory action was received indicating that the amendments in the reply were not entered. This RCE and preliminary amendment are in response to that advisory action. The amendments above and remarks below are based, in part, on the reply.

Claims 6-28 and 29-33 are pending. Claims 6-21 have been cosmetically amended to clarify the subject matter. For example, the term "reverse" conduction type was replaced with the term "second", and the term "one" conductive type was replaced with the term "first" conductive type. Claims 29-33 have been added. Support for new claims 29-33 can be found in the specification, drawings and claims of the current application. No new matter has been added.

This amendment conforms to the pre-OG Notice of January 31, 2003, entitled "Amendments in a Revised Format Now Permitted."

In view of the amendments above and remarks below, applicants respectfully request of the previous rejections and allowance of the application.

Claim Objections

Claim 7 was objected to because of a minor informality. Applicants have amended claim 7 include to the word "high" between the word "forming" and "concentration." Such an amendment makes claim 7 consistent with claim 6. No new matter has been added.

In addition, the claims were objected to because of alleged improper formatting. As noted above, this amendment conforms to the pre-OG Notice of January 31, 2003, entitled "Amendments in a Revised Format Now Permitted."

In light of the above amendments and remarks, the applicants respectfully request withdrawal of the objections.

Claim Rejections – 102

Claims 6, 7, 8, 16 and 22-26 have been rejected under 35 U.S.C. 102(b) as being anticipated by US Patent No. 5,567,629 issued to Kubo ("the Kubo patent").

Amended independent claim 6 recites a method of manufacturing a semiconductor device that includes forming a source layer and forming a body layer of a first conductive type continuous with the source layer and a low concentration drain layer of the second conductive type. For example, referring to FIG. 12A, in one embodiment, this amendment makes clear that body layer 18A is adjacent to and continuous with the source layer 15A and the low concentration drain layer 10A. Support for such an amendment can be found, for example, in claim 27, in FIGS. 5-10 and 12 and on page 18, lines 6-19 of the application. No new matter has been added. Such a structure has certain advantages as discussed, for example, on page 4, line 17 to page 5, line 20 of the application.

The Kubo patent discloses a semiconductor device that includes a buried region 1C located between a source region 4 and a drain region 5. (See FIGS. 2A and 2B) The buried region 1C is **not** formed to be continuous or in contact with the source and drain regions. In fact, the buried region 1C is completely surrounded by a p-type semiconductor layer 1b so as to prevent the buried region 1C from contacting the drain and source regions. In contrast, in the present invention, the body layer is formed of a first conductive type continuous with the source layer and a low concentration drain layer of the second conductive type as recited in claim 6.

For the reasons explained above, the Kubo patent does not teach or suggest such a feature of the present invention. Thus, the Kubo patent does not disclose, teach or suggest claim 6.

Likewise, claim 7 has been amended to recite a method that includes a limitation similar to the limitation recited in claim 6 as explained above. Specifically, amended claim 6 recites forming a body layer of first conductive type continuous with the source layer and a low concentration drain layer of the second conductive type. Since claim 6 should be allowable for the reasons explained above, claim 7 should also be allowable for at least the same reasons. Since claims 8, 9 and 16 depend on claim 7, claims 8, 9, and 16 should be allowable for at least the same reasons as claim 7.

Claim 22 recites a method that includes "doping impurities of the second conductive type into the surface of the semiconductor layer of the first conductive type to form a second conductive type layer." For example, in one embodiment, FIGS. 12B, 13A and 13(B) show a

device having an N type layer 31, 31A and P type layer 32 for controlling threshold voltage are formed in a surface portion (channel region) of the P type body layer 18, 18A and the N type layer 19 of N and P channel type transistors. (See page 21, lines 1-6 of the application) Such a technique may lower threshold voltage and improve the driving capability.

In contrast, the Kubo patent shows source/drain regions 4, 5 and a gate oxide 2 under a gate electrode 3, however, such is not equivalent to the claimed invention. Thus, the Kubo patent does not teach or suggest such a limitation. Thus, the Kubo patent does not disclose, teach or suggest claim 22.

Likewise, claim 23 recites a method that includes "doping impurities of the second conductive type into the surface of the semiconductor layer of the first conductive type to form a second conductive type layer." For the reasons explained above, the Kubo patent does not teach or suggest such a limitation. Thus, the Kubo patent does not disclose, teach or suggest claim 23.

Similarly, claim 24 recites a method that includes "doping impurities of the second conductive type into the surface of the semiconductor layer of the first conductive type to form a second conductive type layer." For the reasons explained above, the Kubo patent does not teach or suggest such a limitation. Thus, the Kubo patent does not disclose, teach or suggest claim 24. Since claims 25 and 26 depend on claim 24, claims 25 and 26 should be allowable for at least the same reasons as claim 24.

In light of the above amendments and remarks, the applicants respectfully request withdrawal of the 35 U.S.C. § 102(b) rejection of claims 6, 7, 8, 16 and 22-26.

Claim Rejections – 103

Claim 9 has been rejected under 35 USC 103(a) as being unpatentable over the Kubo patent in view of US Patent No. 5,926,712 issued to Chen et al. ("the Chen patent").

Claim 7 should be allowable for the reasons given above. Since claim 9 depends from claim 7, claim 9 should be allowable for at least the same reasons as claim 7.

Claims 10, 11 and 17 have been rejected under 35 USC 103(a) as being unpatentable over the Kubo patent in view of US Patent No. 5,688,700 issued to Kao et al. ("the Kao patent").

The Office action states that the Kubo patent teaches substantially the entire claimed process of claims 6 and 7. As explained above, the Kubo patent does not teach or suggest claims 6 and 7.

Moreover, claim 10 recites a method that includes “doping impurities of the second conductive type ... and forming a layer of the second conductive type which ranges to said source/drain layers of the second conductive type and is shallower than said source/drain layers of the second conductive type.” For example, in one embodiment, FIG. 2(b) shows a process of doping impurities of the second conductive type (i.e., N-type) to form low concentration source/drain layers of the second conductive type (“layer 10”) into a semiconductor layer 3. Next, in one embodiment, FIG. 3(b) shows a process of doping impurities of the second conductive type (i.e., N-type) into semiconductor layer 3 and forming a layer of the second conductive type (“layer 13”) which ranges (i.e., is in between) the source/drain layers of the second conductive type 10 and is shallower than said source/drain layers of the second conductive type 10. Thus, the process forms low concentration layers 13 between low concentration layers 10, the layer 13 being more shallow than layer 10.

As discussed above, the Kubo patent discloses a semiconductor device that includes a buried region 1C located between a source region 4 and a drain region 5. (See FIGS. 2A and 2B) However, in contrast, the method of Kubo forms a gap as well as a buried layer 1C between the source/drain regions (4, 5) and does not include “forming a layer of the second conductive type which ranges to said source/drain layers of the second conductive type and is shallower than said source/drain layers of the second conductive type” as recited in claim 10 of the present invention. Thus, the Kubo patent does not teach or suggest such a limitation.

Moreover, the Kao patent does not disclose such a limitation. The Kao patent discloses a method of forming a transistor that includes forming *highly doped* source/drain regions 42, 44 with a *lightly doped* region 19 between the source/drain regions. (See FIG. 16). However, such a method does not disclose “doping ...to form low concentration source/drain layers” and “forming a layer of the second conductive type which ranges to said source/drain layers of the second conductive type and is shallower than said source/drain layers of the second conductive type” as recited in claim 10 of the present invention.

Thus, neither the Kubo patent or the Kao patent, alone or in combination, disclose, teach or suggest claim 10. Since claims 11 and 17 depend on claim 10, claims 11 and 17 should be allowable for at least the same reasons as claim 10.

Claims 12-15, 18 and 19 have been rejected under 35 USC 103(a) as being unpatentable over the Kubo patent in view of the Kao patent and in further view of Shida (US 6,033,944).

As explained above, claim 12 has been amended to recite a method that includes “doping impurities ... to form a body layer of a first conductive type, wherein the body layer is continuous with the source/drain layers of the second conductive type.” Support for such an amendment and any advantage of such a feature is explained above. For the reasons explained above, the Kubo patent does not teach or suggest such a limitation. Thus, none of the references, alone or in combination, disclose, teach or suggest claim 12. Since claims 13 and 18 depend on claim 12, claims 13 and 18 should be allowable for at least the same reasons as claim 12.

Claim 14 recites limitations similar to claim 10 as explained above. Specifically, claim 14 recites a method that includes “doping impurities of the second conductive type ... and forming a layer of the second conductive type which ranges to said source/drain layers of the second conductive type and is shallower than said source/drain layers of the second conductive type.” For the reasons explained above related to claim 10, the Kubo patent does not teach or suggest such a limitation. Thus, Kubo does not disclose, teach or suggest claim 14. Since claims 15 and 19 depend on claim 14, claims 15 and 19 should be allowable for at least the same reasons as claim 14.

Claims 27 and 28 have been rejected under 35 USC 103(a) as being unpatentable over the Kubo patent in view of Shida.

Claim 27 recites a method that includes “forming high concentration source/drain regions of the second conductive type in the low concentration source/drain regions and a gate electrode formed on a gate oxide film provided on the semiconductor, wherein the low concentration source/drain regions extend from under the gate electrode, and the low concentration source/drain regions surround the high concentration source/drain regions.” For example, in one embodiment, FIG. 4(b) shows a method that includes forming low concentration N-type source and P-type drain layers 10, 11 and a high concentration N-type source/drain layers 15, 16 such that layers 10, 11 surround layers 15, 16. In contrast, the Kubo patent discloses source/drain

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regions 4, 5, having both high and low concentration areas, however, such a techniques is not equivalent to the above quoted limitation of claim 27. Thus, the Kubo patent does not teach or suggest such a limitation. Thus, Kubo does not disclose, teach or suggest claim 27.

Claim 28 recites a method that includes a limitation similar to claim 27 above. For the reasons explained above, the Kubo patent does not teach or suggest such a limitation. Thus, the Kubo patent does not disclose, teach or suggest claim 28.

In light of the above amendments and remarks, the applicants respectfully request withdrawal of the 35 U.S.C. § 103(a) rejections of claims 9, 10, 11, 12-15, 17, 18, 19, 20, 21, 27 and 28.

Conclusion

Applicant asks that all claims be allowed.

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Respectfully submitted,

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